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ABSTRACT

In spite of growing uses of information technologies, institutional policies for job classification and compensation in the information fields appear not to be keeping pace with changes in actual job content. The job streams that have been in existence for decades have not been adjusted to take into account the significant alterations occurring at working levels on campuses. Drawing on a study conducted from 1990 to 1992, this paper provides some empirical evidence that points toward the need to create one information job family and some models that point in the direction of the future. The exploratory study analyzed 63 jobs in computing centers and libraries at three selected institutions. The notion that a single job family for academic computing and library jobs is emerging was validated through this study. Also apparent was the need for analytical factors to be selected carefully and adjusted to reflect the values of the institution. Implications of the study are explored. Two appendixes list job evaluation factors and give job descriptions. (Contains 26 references.) (SLD)

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Reinvesting in the Information Job Family:

Context, Changes, New Jobs, and Models for Evaluation and Compensation

by Anne Woodsworth and Theresa Maylone

Published in cooperation with
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CAUSE
4840 Pearl East Circle, Suite 302E
Boulder, Colorado 80301
Phone: 303-449-4430
Fax: 303-440-0461
E-mail: info@CAUSE.colorado.edu

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About the Authors

Anne Woodsworth *is Dean of the Palmer School of Library and Information Science, which prepares people for positions in the information job family, at Long Island University. Her career in the information field includes being Associate Provost and Director of University Libraries at the University of Pittsburgh and Personnel Director at Toronto Public Library. She has published four books in the past five years, serves on CAUSE's Current Issues Committee, and frequently speaks on the impact of the information technologies in higher education. She has a BFA from the University of Manitoba, a BLS and MLS, and a PhD in higher education administration from the University of Pittsburgh.*

Theresa Maylone *is Coordinator of the Palmer School of Library and Information Science program at Long Island University's Westchester Campus, and an active member of the adjunct faculty. As Manager of Information Resources for General Foods Corporation and Kraft General Foods International, she directed projects on the application of information technology to business organization design and development. She has a BA from Syracuse University and an MS from Pratt Institute.*

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FOREWORD

Information technologists and librarians, like everyone else on college and university campuses today, can't help but be aware of the changes occurring:

- accelerating demand for access to information, whether generated on campus or from external sources, from faculty, staff, and students,
- a need to revisit traditional ways of "doing business" in order to satisfy this demand, and
- strong synergy between the functions of those who create and support the infrastructure that represents the conduit for the flow of information and those who have always focused on navigation of information pathways to connect seekers of information to the resources they seek.

As we explore new alternatives for organizational structure and job definitions, in light of the new ground rules, to best achieve the goals and objectives of our institutions, we are fortunate to have the benefit of the research and analysis of Anne Woodsworth and Theresa Maylone to guide us. These authors are well qualified to address these issues, having had career experiences in both the library and information technology arenas—relatively unique today, but likely to be much more common in the future as the concept of the "information job family" becomes a reality.

Jane N. Ryland
CAUSE President

These are exciting times for libraries and computing centers, as we struggle with the dual-edged sword of increasing forms of information and budgetary constraints. Technology is an important change agent in organizational environments, as we know from our collective experiences in colleges and universities nationwide.

The basic foundation of any organization is the personnel. As our employees gain new skills through education and staff development activities, it seems natural to seek ways to compensate them for their new levels of knowledge and performance. Library directors, computing directors, and human resources management offices have struggled with these issues, while watching our employees grow in knowledge and skills as information services automate to serve new and traditional information needs of our campus constituency.

A continuing concern is how to appropriately classify personnel in this new and changing environment. Anne Woodsworth and Theresa Maylone offer a research-based solution with their concept of an "Information Job Family." As President of the Association of College & Research Libraries, I am pleased that ACRL is participating in the publication of this CAUSE Professional Paper with CUPA.

Jacquelyn A. McCoy
ACRL President

In the "flatter" organizational management structure of the future, communication and decision-making will be more open, more outcome oriented, and more flexible.

As noted in the Introduction, "Human resources policies are among the strategies that can ensure success for the future." Yet emerging information technologies are capable of changing the very manner in which higher education conducts business. In areas as rapidly changing as information technology and human resources, this study underscores the value of creating dialogues and forging partnerships to benefit the higher education community.

The College and University Personnel Association is pleased to participate in this Professional Paper publication in conjunction with CAUSE and the Association of College & Research Libraries.

Let the dialogue begin!

Richard Creal
CUPA Executive Director

1 INTRODUCTION

"Colleges and universities should explore their personnel policies with a view to: (1) increasing incentives for employee initiative, (2) expanding the scope of generalized job classifications, and (3) examining biases within existing classification and reward systems."
R.N. Katz and R.P. West[1]

The belief that information technology continues radically to alter both the form and substance of work is widely held in colleges and universities as in the world at large. Additionally, there is recognition of the complementary relationships of often separate information operations such as academic computing, telecommunications centers, and libraries. This has led many colleges and universities to question the appropriateness of their organizational structures, particularly when a significant investment in information systems, resources, and services is anticipated. On some campuses, albeit a minority, this has led to the creation of a chief information officer's (CIO) position, under whose umbrella of responsibility these individual information units may be clustered.

Observation of campuses that have CIOs in place and are considered to be on the leading edge of the use of the information technologies can easily lead to conjecture about whether or not the nature of the work within individual units might also have changed substantially as a result of (a) all units reporting to a CIO and (b) having gone beyond the automation-of-processes stage in the use of the technologies. An interested observer might find it difficult to distinguish, for example, between the roles of some library and computing center staff in the use and application of the information technologies on campuses.

As suggested by Katz and West,[2] human resources policies are among the strategies that can ensure success in the future. They are not easily addressed, however, particularly since reexamination and removal of biases entail shaking up traditional job classification structures and ripping apart traditions such as having different job "families" for the information workers on campus, e.g., a job family for library jobs, and another for computing/technology jobs. Such job structures can create an anomaly between job content and the job classification structure.

Despite growing confluence in the use of the information technologies, performance of seemingly comparable work, and sometimes strong administrative connections in such organizations, institutional policies (as reflected in classification and compensation systems) appear not to be keeping pace with changes in actual job content. The job streams or "families," with their differing evaluation structures, pay scales, and benefit

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[1] Richard N. Katz and Richard P. West, *Sustaining Excellence in the 21st Century: A Vision and Strategies for College and University Administration*, CAUSE Professional Paper #8 (Boulder, Colo.: CAUSE, 1992), p. 16.

[2] Ibid., p. 16.

status that have been in existence for decades have not been adjusted to take into account the significant alterations occurring at the working levels on campus. It is relatively easy to deduce such discontinuity; it is more difficult to prove and even tougher to find new models that redress the problems. This paper provides some empirical evidence that points toward the need to create one information job family and some models that point towards the directions needed in the future.

From 1990 to 1992 a research project, funded by the Council on Library Resources, tested a methodology that could be used to analyze the presence and degree of similarities in job content, particularly of jobs in libraries and in academic computing centers at campuses where there had been a high degree of information technology integration. It was hypothesized that jobs had altered significantly enough to identify a single new job family out of two or more traditionally separate job categories for library and academic computing/networking personnel. The study was exploratory and identified areas in which further research could contribute to establishing workable models.

A total of sixty-three distinct jobs in computing centers and libraries at three selected institutions were subjected to a point-factor analysis in order to determine the levels of skills, knowledge, responsibilities, and other compensable factors present within each job. The results indicated that a small number of jobs could be considered identical; a large number had knowledge, skills, and competency requirements that were similar in part; and another small number contained no similarities. Some new tasks and new jobs were identified. More importantly, however, the common traits—features or qualities—of the jobs were distinguished. An unanticipated result of the study was recognition of the need for institutions to develop a commonly understood language for use in job descriptions, if they are to be the primary basis for job evaluation. Without clarity in the meanings of specialized and professional jargon, the job evaluation system remains biased and comparability in classification and compensation cannot be ensured.

The study validated the notion that a single job family for academic computing and library jobs is emerging in the set of jobs examined. Broad generalization to the entire higher education environment would have required a much larger sample and a finer analytical measure than that employed in this exploratory study. While further research is indicated and is both worthwhile and necessary, workable models for human resources planning and organizational development can best be developed from the integration of the many approaches available in a growing body of literature on organizational reengineering. We suggest one such amalgamated methodology here.

Also apparent from the study, and consistent with the wider considerations of the original research design, was the need for analytical factors to be selected carefully and to be adjusted so that they adequately express and clearly define an institution's values, goals, and desired future outcomes. The constituencies of colleges and universities are many. They must reflect a philosophy that reflects the unique, distributed environment in higher education. All must be acknowledged and served, and must bear a relationship to one another and to the organization as a whole. Individual factors—knowledge, skills, responsibilities—chosen by an institution to define jobs will become the factors that the institution values. These compensable factors and the amount of worth placed upon them will reinforce in practice the espoused values of the institution. Therefore, they are of critical strategic importance in the process of effecting and managing change in times and environments where change may be the only constant.

2 The Information Job Family on Campus

"Most important, the effects of technological change on the skill requirements of work are set in a larger context of market forces, managerial prerogatives (in implementing technologies), and organizational cultures, all of which condition the effects of technological change."
Kenneth I. Spenner[3]

As a change agent, information technology is almost without peer. Whether the change itself is evolutionary or revolutionary may be a semantic distinction best decided by history. What is indisputable today is that the opportunity exists for all information service and information systems units to form a partnership and use the technologies to manage the change creatively. Our study, reported in this paper, focused on academic computing services and libraries and how these two groups, which have consistently assumed major information technology roles on campus, might influence both structure and infrastructure on the "transformed" campus. The other groups of information workers on campus such as those in administrative computing centers, network and telecommunications operations, media centers, and even academic units are clearly also affected and need to be part of the partnership efforts.

Stakeholders

The transformational changes propelled by the information technologies are sometimes difficult to articulate in terms that convey information's preeminence to the variety of stakeholders in the academic community, although Ryland, Penrod, Euster, and Lowry did admirably well at a 1992 conference.[4] Among the stakeholders are, of course, those in the immediate academic enclosure, such as students, faculty, and administrators who participate in the entire information chain from creation to consumption. Other stakeholders exist in the broader higher education environment. Trustees, research and grant-making bodies, the information industry, and society itself are full partners in the creation, dissemination, and use of information. Finally, there are stakeholders whose responsibility it is to manage the intersections and communication processes.

The communication difficulties inherent in complex communities such as academe are caused in part by the

[3]Kenneth I. Spenner, "Technological Change, Skill Requirements, and Education: The Case for Uncertainty," in Richard M. Cyert and David C. Mowery, eds., *The Impact of Technological Change on Employment and Economic Growth* (Cambridge, Mass.: Ballinger, 1988), pp. 132.

[4]Their papers are included in *Information Management and Organizational Change in Higher Education: The Impact on Academic Libraries*, Proceedings of the 1992 Computers in Libraries Conference (Westport, Conn.: Meckler, 1992).

nature of information itself. It is elusive to define. Some define it by placing it in operational contexts.[5] Information itself, along with its accompanying technologies, crosses administrative and academic boundaries. The technologies can physically "capture" information in a variety of forms, from clay tablets to laser disks.

To bring order to the management difficulties and to define, manage, and convey their information priorities, some academic institutions have created a position generically called chief information officer (CIO). The CIO role represents one approach to creating an organizational umbrella for structuring information-related operations. The CIO model has many variations and recent research has found that 90 per cent of colleges and universities in the United States, as well as an increasing number of corporations, manage their functions without a CIO.[6] Designating responsibility for existing information systems and services to such a person is assumed to ensure a unified structure for information functions and planning. Implied also are changes to the institution's infrastructures such as communication and social organization, e.g., through different communication pathways, shared databases, and networked access to internal and external information. But what about operating functions themselves, such as libraries and computing services? How deeply into the organization does a changed administrative structure penetrate? What is the effect on the infrastructure? Does leadership for change occur from the bottom up as well as the top down—or even from the middle out?

There is no dearth of potential models that help to address these questions. An excellent literature review, which places conceptual change models in an environmental and social context, is found in Penrod and Dolence's paper, *Reengineering: A Process for Transforming Higher Education.*[7] The networked model, brought into existence by information technology, is certainly an expression of the reengineered organization. As thoughtfully described by Sproull and Kiesler, an exemplary technology such as electronic mail can transform the academic environment as well as the business environment.[8] Another prominent model is used by Zuboff,[9] who coined the word "informated" to describe organizations that have done more than just replicate older work processes in an automated environment, but rather have "transformed" the organization by using the capabilities of information technology to an "informated" stage.

Although models such as these hold promise for academic institutions, success will depend upon changes not just to the structure but also to the organization's ambiance and its inherent philosophies and values. Models cannot be used in one-to-one correlations between corporate and academic settings or even lifted from one institution to another. Since they cannot simply be *adopted*, there must be a process and stance of *adapting*.

In the academic environment, the two largest units in which technologies have been utilized are the academic computing centers and the libraries. Traditionally they have been defined as separate units, most often reporting to different senior officers in the campus hierarchy. Even when both are managed by a CIO, they have remained relatively "unintegrated" operationally, and both tend to have deep internal hierarchies. Other campus units have variously been integrated with academic computing, voice and data telecommunications, and other units.

Current technological trends include moving to a client-server environment. This argues for technological diffusion, decentralization, and ultimately dispersion

[5]Fritz Machlup and U. Mansfield, eds., *The Study of Information: Interdisciplinary Messages* (New York: Wiley, 1983); and Michael Buckland, *Information and Information Systems* (New York: Praeger, 1991).

[6]James I. Penrod and Michael G. Dolence, "Transformation and the Chief Information Officer," in Gary Pitkin, ed., *Information Management and Organizational Change in Higher Education: The Impact on Academic Libraries* (Westport, Conn.: Meckler, 1992); and C. Wilder, "No room at the top: When the CIO becomes expendable," *Computerworld*, 17 February 1992, pp. 1, 16.

[7]James Penrod and Michael G. Dolence, *Reengineering: A Process for Transforming Higher Education*, CAUSE Professional Paper #9 (Boulder, Colo.: CAUSE, 1992), pp. 1-11.

[8]Lee Sproull and Sara Kiesler, *Connections: New Ways of Working in the Networked Organization* (Cambridge, Mass.: The MIT Press, 1991).

[9]Shoshanna Zuboff, *In the Age of the Smart Machine* (New York: Basic Books, 1988).

of functions out of both academic computing and libraries. As this occurs, jobs will become more difficult to control and to monitor in terms of value and comparability across the organization. An academic department chair may simply not know how to describe the job of his or her one "technology expert." Whereas there may be many such positions, they are not easily comparable in scope and content to jobs in a centralized unit such as the academic computing center or the library. As the following section will reveal, comparison of jobs across those latter two units is not easy. All of this argues for the serious attention being given to the aspects of human resources management that have remained unchanged.

Development of One Information Job Family

There are a number of propellants that fuel the need for colleges and universities to focus on redesign of their human resource management systems in addition to the broader societal and philosophical issues just described. Confirmation that jobs in fact are changing pushes older paradigms beyond their usefulness. According to Katz and West, increasing emphasis on judgment and accountability will make some values within existing reward systems less meaningful.[10] Although clerical jobs may be eliminated, higher level technical jobs are created that require more skill and education.[11] Bi-modal organizational structures combine elements of traditional forms with novel technologies and management processes, and are at once centralized and decentralized. Some seem to be operating in academe already. Yet, the degrees of integration found in some high tech firms by Bahrami and Evans[12] seem to clash with traditions in higher education where academic territorialization still is the norm. They argue that the disruptions of formal organizational restructuring can and should be superseded by deployment of novel technologies and management processes. They, as well as Katz and West, advocate team performance that cuts across organizational lines. Mowshowitz emphasized the need for management attention to specific human resource issues, primarily training and retraining. His case studies led him to conclude that

> changing skill needs will require adjustments in existing job classifications ... willingness to accept flexibility in work rules ... accepting more autonomy for the skilled worker ... and compromising on the rigid job classification schemes of the past.[13]

An Exploratory Study

Most colleges and universities have job classification schemes that segregate faculty from all others, with approximately one-third including librarians as full faculty. Traditions further divide and subdivide staff into job families such as clerical, administrative, technical, library, custodial, and so forth. Libraries and computing centers are, for the most part, perceived as having separate and distinctive functions, and thus their jobs tend to be slotted into two separate job families.

Informal observation at campuses with a high degree of administrative integration could be presumed to have jobs in libraries and computing centers that are similar and cross over in terms of function—one might assume that they are comparable. Cursory observation seems to indicate that professionals and staff in both libraries and computing centers do similar tasks:

- develop training tools and system documentation
- design, operate, and use local and wide area networks
- plan, select, install, and operate systems and software applications on all types and sizes of hardware
- collect and organize data and information in various forms and formats
- create, maintain, query, and manage databases
- analyze user, service, and system needs
- provide consulting and technical assistance
- instruct faculty, students, and staff

The goals of these activities also seem to be much the same, namely helping the end users to file, retrieve, and use information using the technologies.

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[10] Katz and West, p. 14.

[11] Desmond Martin and Richard L. Shell, *Management of Professionals: Insights and Maximizing Cooperation* (New York: Dekker, 1988), p. 336.

[12] Homa Bahrami and Stuart Evans, "Emerging Organizational Regimes in High Technology Firms: The Bi-Modal Form," *Human Resource Management* 28:1 (1989): 25-50.

[13] Abbe Mowshowitz, "On Managing Technological Change," *Technovation* 9 (1989): 623-633.

TABLE 1

JOB EVALUATION FACTORS

KN	Knowledge
EX	Experience
SR	Degree of supervision received
AS	Analytical skills
FR	Financial responsibility
IA	Impact of actions
SE	Nature of supervision received
HR	Scope of human resources impact
IC	Internal contacts
EC	External contacts
PE	Physical effort

Our exploratory study[14] was designed to determine whether or not jobs in libraries and academic computing were similar, and to test a methodology for measuring their similarities and comparability. Jobs in libraries and academic computing centers at three universities reputed to be at the "informated" stages of their use of the technologies were analyzed during 1991-1992.[15] The study excluded computing activities occurring in other units such as administrative services, academic departments, and research centers to keep the project a manageable and affordable size.

A recently developed point-factor job analysis system from the University of Pittsburgh was used for the study. It enabled identification of the most important compensable factors and provided a rough coding structure for content analysis for the jobs.

Jobs were analyzed using the factors shown in Table 1. (See Appendix A for a more complete description of each of the factors.) Each factor had a rating scale that reflected the degree to which a job had a particular factor. Most factors were rated on a single dimension (knowledge, experience, analytical skills) and were assigned raw scores from 1 (low) to 8 (high). More complex factors, namely financial responsibility and the degree of supervision exercised, were rated on a two-dimensional matrix and assigned raw scores from 0 (absent) to 48 (high). The total and final value of the job was calculated by an algorithm that included a multiplier for weighting each factor. Thus, the resulting total weighted points (TWP) for each job determined the responsibility level and corresponding salary range.

The universities that agreed to participate were relatively large and all had:

- the library and the academic computing center at the same level in the organizational hierarchy
- a high degree of potential administrative integration, in so far as both the library and academic computing center reported to a single individual
- reached an advanced stage in using the technologies, according to peer judgment.

Only jobs that did pure "information" work, namely "library" and "computing" work, were analyzed. All administrative, secretarial, vacant, frozen, and part-time positions were eliminated from the study. Because the intent was to look at the entire range of jobs, no distinctions were made between "professional" and "non-professional" or exempt and non-exempt. Duplicate jobs were also eliminated. For example, if the same description was used for four systems analysts, only one was used in the study. Out of 371 descriptions supplied by the three sites, 63 unique jobs ended up being fully analyzed. Confidentiality was ensured by use of codes rather than names or position numbers.

The first problem encountered in analyzing jobs was the rich array of professional jargon used, particularly by the libraries. To ensure validity and comparability, job descriptions were rewritten/translated to eliminate as much jargon as possible. These were used at each site with the teams that assigned the factor points for each job when there was misunderstanding amongst

[14] A full report of the methodology and data analysis is available in an article by Anne Woodsworth, Theresa Maylone, and Myron Sywak, "The Information Job Family: Results of an Exploratory Study," *Library Trends* 41:2 (1992): 250-268.

[15] The institutions selected for the study were Carnegie Mellon University, Vanderbilt University, and Virginia Polytechnic Institute and State University.

the team or lack of clarity in the job description. For example, "OPAC (online public access catalog)" became "campus-wide information system," "debug" became "correct a problem," and "performs descriptive/original cataloging" was translated into "creates and corrects records for inclusion in local, national, and/or international databases."

Overlap in job functions

The study indicated total or partial overlap on several important factors among the library and computing jobs examined, and some overlap in entire jobs as well as parts of jobs. Therefore, there is merit in reexamining the traditional multiple family philosophy that underpins most university job classification systems. For colleges and universities in the process of changing organizational structure and/or compensation values, the methodology for this study could be a helpful evaluation tool.

The degree of overlap in the jobs followed a bell-curve distribution with a small number in which there were no similarities, a majority that were similar in part, and another small number that were identical. Following are the types of jobs found in both libraries and academic computing centers:

- *Systems analysis and design*, which might include programming for microcomputer applications and micro-mainframe links, network design, implementation and maintenance, design or redesign of communications paths in the delivery of information, or preparing system usage guides and documentation.

- *User services*, involving problem-solving preparation of end-user documentation, individual and group instruction in the use of online systems, applications software, networks, and peripheral equipment such as CD-ROM readers or scanners.

- *Resource collection*, involving the acquisition of software and information products in a variety of formats for students, faculty, and staff, and making these files, materials, and services available for use.

- *Support services*, such as data entry, remote user support, maintenance and development of databases for internal operating purposes (user lists and profiles, billing and administrative files), or preparation and analysis of operating reports such as transaction logs monitoring use levels by types and categories of users.

Clearly, the common thread in these jobs was the use of various information technologies.

TABLE 2

SIMILARITIES

FACTOR	LIBRARY *r* =	COMPUTING *r* =
AS:KN	.70	.72
AS:SR	.81	.75
AS:IA	.69	.74
HR:SE	.71	.85
IC:KN	.69	.70
IC:AS	.74	.71
EC:FR	.68	.69
EC:SE	.71	.78

***r* = correlation**

Likenesses in job factors

As shown in Table 2, the strongest likenesses were found in analytical skills (AS), human resources impact (HR), internal contacts (IC), and external contacts (EC). Both library and computing jobs correlate these four factors strongly with knowledge (KN), amount of supervision received (SR), impact of actions (IA), supervision exercised (SE), analytical skills (AS), and financial responsibility (FR).

Both organizations in the institutions studied require analytical skills equal to the complexity and scope of the functional areas covered. Most positions have work that is non-standardized and widely varied, involving many complex and significant variables. A level of analytical ability and inductive thinking is required that can deal with extensive adaptation of policies, procedures, and methods sufficiently to handle complex decisions. Educational level, the degree of autonomy, and the breadth of potential consequences from actions taken were all meaningful characteristics in both sets of jobs.

If supervision received is considered as a measure of autonomy and is combined with high correlations to knowledge and analytical skills, then significant individual "empowerment" appears to have already taken place on these campuses. Supervisory levels were high in both sets of jobs, as indicated by the correlation with human resources impact and the amount of supervision exercised. Internal and external contacts measured how extensively and to what level a job might have contact throughout the organization and beyond the institution. Because the correlations with internal contacts were strongest with knowledge and analytical skills, contacts appear wide across each campus. External contacts beyond the campus to outside resources, such as hardware and software suppliers, consultants, database and other product vendors, had a strong relationship with amount of financial responsibility and amount of supervision exercised in both units.

Comparative distribution of aggregate raw points pointed out a few differences between the libraries and computing centers. For example, in knowledge (KN) libraries had 52.1 percent of jobs with a value of 7, compared with 26.7 percent of the computing jobs with a value of 7 or 8. This reflects the prevalence of the professional master's degree in library jobs.

In terms of experience (EX) required, the majority of library jobs cluster in the ranges represented by three months to five years, while the computer jobs indicate somewhat higher experience requirements ranging from two to nine years.

The degree of supervision received (SR), as indicated earlier, is an autonomy measure. No jobs in either library or computing centers were assigned a 1, which represents the need for close supervision. The most frequent value was 4 ("general direction, working from broad goals and policies only; incumbent participates heavily in setting work objectives") and this appeared almost equally frequently in both organizations.

For analytical skills (AS) or the amount of complexity, non-standardized work, and inductive thinking, library jobs showed greater variation across all point values, while computing jobs were concentrated at the level where "previously unsolved problems" (a value of 6) would be encountered as a matter of routine.

Financial responsibility (FR) was measured on both level of responsibility (payment authorization/ budget preparation) and size of budget administered. Approximately half of the staff in both libraries and computing centers had no financial responsibility, but varying degrees of such responsibility was spread more evenly among library jobs than among computer jobs. This variability is, of course, locally and institutionally driven. It can be influenced by policy as well as management styles. For example, some institutions distribute management of material, equipment, and supply budgets, while others have this control centralized. Librarians sometimes neglected to value their control of university-wide financial responsibility. For example, the budgetary responsibility of librarians who controlled budgets for materials, for which they were responsible and accountable to the entire campus community, was overlooked by one reviewing team.

Possible impact of actions (IA) ranged from "minimal" through "major." While it is important to avoid reading into the data more than is present, it would seem that computer jobs were considered to have a much greater impact: 86.6 percent ranged from "significant" to "major," while 91.7 percent of library jobs ranged from "moderate" through "substantial."

Supervision exercised (SE) was measured by the number of different functions supervised and by the complexity that the supervision entailed, i.e., how technical or non-standardized it was. One-third of the library jobs had no supervisory role, but the remaining two-thirds were spread throughout the levels more completely than the computing jobs were. Both groups had peaks at 8—a moderately high degree of supervision.

The human resources (HR) impact factor measured the degree of hiring and compensation authority, responsibility for performance appraisals, and staff development. Among the library jobs, 83.3 percent had moderate to high responsibilities, particularly for interviewing and staff development and planning. Among the computing jobs, 100 percent of the jobs fell within this range. The absence of any jobs rated at the highest rating is probably due to the requirement that this level coordinates human resources for more than one area.

The internal contacts (IC) factor was measured by the level of contact across an area, department, school, or administrative unit, and the nature of that contact (from routine to diplomatic/negotiating). This is an area where computing jobs were heavily represented at the high end of the scale, while the library jobs, although near

the high end, were spread more completely throughout the range.

The external contacts (EC) factor indicated the nature and level of contact with people outside the campus. There was more variability among the library jobs, but with concentrations at levels where contact and negotiation with vendors and information agencies occurs. The computer jobs ratings were at levels that indicate contacts are to solve problems with service and product representatives.

Physical effort (PE), i.e. lifting, climbing, moving heavy objects, was a factor that had little implication for jobs in this study and it was not considered in the full data analysis range and in interquartile ranges.

The weighted total derived through point-factor analysis is typically used to determine salary ranges. The chart below spreads library and computing jobs along the total weighted point range and in interquartile ranges.

The weighted points in the second and third quartile (interquartile) ranges were lower for the library jobs than for the computing jobs, indicating more library jobs at lower values. However, among the highest level jobs, those in the top quartile, factor point values were significantly higher for library jobs than for computing jobs. Consequently, when total points for all jobs in the study were ranked together, factor points were 23 percent higher for the library group, even though salaries were 13 percent lower than the computing group. The distribution of computing job weighted points was very nearly bell-shaped. Seventy-seven percent of the library jobs were below the median rating of computing jobs. Salary information provided by participants indicated that in salary dollars, 58 percent of the library jobs were below the computer jobs' median salary of $27,702. The point-factor analysis formula used for these jobs did not consider the influence on salary of other factors such as seniority, merit increases, or gender. However, 42 percent of library salaries were still below the lowest computing salary.

Jargon obscures value

Library jobs were often disadvantaged in point assignment until tasks and even titles were "translated" by teams. For example, the total weighted points of a library serials acquisition assistant were closer to those of a systems analyst than to a data entry operator. This illustrates the danger of allowing professional jargon into job descriptions. Phrases such as "check in standing orders on XYZ system" and "monitor problems and work on their resolution with OCLC" were in the serial assistant job description. The description of the systems analyst job included "designs, tests, maintains, and modifies computer-based information systems," and the data-entry operator's read, "operates data-entry devices and performs all types of data entry." By the description, the serials assistant's responsibilities seemed remarkably like a data-entry operator's, and it was only through a review of other factors that the true impact of problem resolution within an international database (OCLC) was clarified.

This single example points to some of the difficulties that job analysts will have with jobs in "informated" environments if they rely only on traditional job evaluation systems:

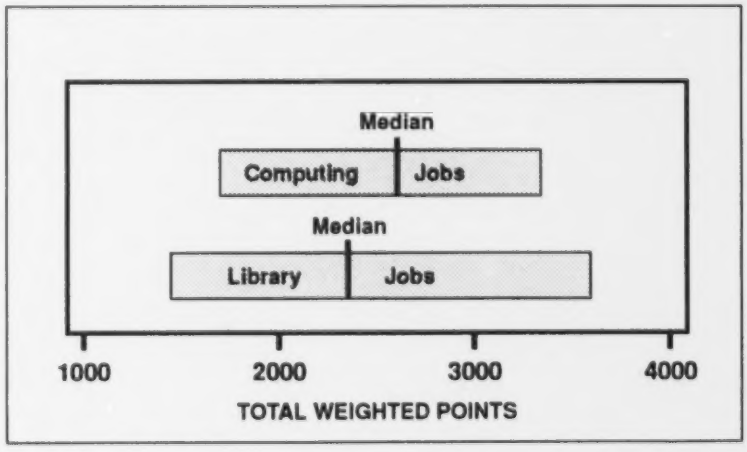
(1) lack of ability of incumbents and supervisors to describe the true nature of the work done;

(2) lack of standardized terminology or guidelines that enable intra-institutional uniformity and a common understanding of technical/professional terminology; and

(3) lack of a method to identify or adapt factors that can attest to the impact of "informated" jobs.

New jobs emerging

Although some content analysis was done at the time of the study, the job descriptions were collected in early



1990, and more recent cases were therefore sought to illustrate the kinds of new information jobs that are emerging. Examples were sought of integrated jobs that straddle library and computing lines and that might be benchmarks for a single information job family. Descriptions were solicited on two BITNET listservs—PACS-L and LIBADMIN—in the early part of 1993.

Job titles and descriptions did not provide institutional context, the degree of information technology integration, or the administrative structure within the institution. However, each of the jobs included in Appendix B showed the same fundamental cohesion found in the library and computing jobs in the 1990-1992 study, particularly if the overlay of jargon were removed.

Like the jobs in the original study, these new jobs clearly point to even more muddying of the two job streams—academic computing/technology and library. One of the respondents to our listserv request descriptions commented that the institution's personnel department said the job described was a computer department job, not for someone with a master's degree in library science. Another respondent commented, "Some think I'm searching for the impossible, a personable techie, but I think they're out there. And it's the type of person we need at this stage in our development."[16]

These statements echo what the original study found: it is the set of skills, knowledge, experience, and competencies which is of central concern, not the departmental affiliation of the position or the source discipline of the qualifying degree. Creating a single job family strengthens the career paths for all information workers, and formalizes what some have fashioned creatively for themselves.

In the examples in Appendix B, not all jobs that required a master's degree in library science were housed in the library. Some were in academic units such as extension services, in academic computing, and in research labs. Not all the jobs that were housed in the library confined their educational requirements to the traditional master's degree in library science. A number of them indicated willingness to accept related master's level degrees such as information science/systems/management and computer science. This is yet another indication that education as well as tasks, skills, and whole jobs are crossing traditionally separate boundaries.

Job Evaluation Models for the Future

The job evaluation system used in the study described above has severe limitations when it tries to judge the impact of technological and other changes. New job evaluations systems are needed that accommodate and contribute to planning for change, that can predict the new knowledge, skills, and abilities needed as jobs change and/or new ones develop. Without such bases of information, it will be impossible to anticipate hiring and training needs as technological changes are introduced. Similarly, it will be important to anticipate changes in the relative importance of new and old factors in jobs, as well in the values (ultimately salary) that an organization will place on those factors, and ultimately to whole jobs.

Schneider and Konz agree that it is impossible to apply existing job analysis techniques and expect that information about current jobs will be adequate to develop strategic planning for human resources.[17] They suggest a methodology for a strategic job analysis that builds on traditional job analysis procedures to more accurately predict the kinds of people that need to be recruited and selected and the kinds of training they should actually receive. They refer to this as "multimethod job analysis." The steps they outline for this process include:

- interview workers about/observe jobs
- cluster tasks to build task clusters
- survey and rate tasks for importance and time spent
- analyze results technically (statistically) and comparatively
- identify (with supervisors and experts) sets of knowledge, skills, and abilities (KSA) clusters
- rate KSAs for importance, difficulty to learn, and when learned
- use groups to identify future issues that impact a job (e.g., information/technology/ markets)
- revise tasks and KSAs and/or their clusters.

For this methodology to be useful, Schneider and Konz admit that "the process involved in generating informa-

[16]John W. Beecher, Director of North Dakota State University Libraries, in an electronic mail communication with the authors, February 25, 1993.

[17]Benjamin Schneider and Andrea M. Konz, "Strategic Job Analysis," *Human Resource Management* 28:1 (1989): 51-63.

tion about the future and then using this information to modify an existing job analysis has yet to be finalized."[18] They report some success using "subject matter experts" in groups and describe their desirable traits and composition at some length.

Our study found that jobs that are technologically grounded in academic libraries and academic computing centers do exist along a continuum that represents the past as well as the exploratory boundaries of the future. Therefore, we would propose that an array of jobs that can be identified as belonging to the new information job family (such as those in Appendix B) might be used in lieu of the survey step suggested in Schneiderman and Konz's process. Through these, the knowledge, skills, and abilities needed by the entirety of the campus could be identified. If campus-wide strategic planning for use of the information technologies is in place, the step of identification of goals for new jobs devolves fairly readily into identification of new jobs and required knowledge, skills and abilities, and training and re-training needs.

So far, this discussion has not addressed the need for human resources management approaches to more accurately reflect the rate, direction, extent, and desired outcome of organizational change. The traditional factors used in existing job evaluation systems, such as the point-factor analysis method used in our study, will need to be revised. Such formula approaches may be relatively easy to administer, but lack sufficient refinement to reflect organizational character and cultures. Once a job evaluation system has been put into place, it is not uncommon for it to remain unchanged for ten years or more, particularly in large organizations. The tendency to become static once developed can only be overcome by attentive management of the evaluation system, ideally by cross-organizational teams which regularly reassess factors, weights, job family boundaries, and the relationships of salary scales to the range of points assigned to factors. Point-factor methods are also acknowledged to be deficient in evaluating higher level jobs. Therefore, human resource managers and researchers together may need to develop new factors and new weights that can establish the comparable worth of jobs across an organization. Social and organizational values, the success of project-oriented teams, and the effects of organizationally learned behaviors such as TQM, also need to be considered in determining the worth of jobs.

Schneider and Konz built their multimethod analysis using current job evaluation methods. Many consulting firms are available to help develop factors that will clearly express an organization's values and outcomes. Outside consultants are neither mandatory nor necessary as long as there is organizational commitment to an open and iterative approach to alteration of the job evaluation system.

If an organization were to express its perceived need to foster change and encourage new areas of growth, factors such as managing change, volatility of tasks, and creativity might be selected. For example, one or two factors such as managing change/creativity could define the extent to which a position is responsible for recognizing and defining needs, and developing innovative ideas and creative solutions which enhance the quality of services, cost-effectiveness of operations, and client responsiveness. Volatility might include degrees which indicate the frequency with which a position deals with new generations of hardware, new versions of software, and/or the severity of the resulting changes in operations, policies, and procedures. Factors such as these could replace or augment the more traditional factors such as those used in our study (e.g., knowledge, experience, internal contacts). Enhanced this way, Schneider and Konz's multimethod process might be adapted to accommodate institutional values such as effective use of the information technologies. A final modification that would be needed to allow a single, new information job family to be recognized would be to desegregate two traditional job families in particular—library and academic computing/technology.

[18] Ibid., p. 55.

3 IMPLICATIONS

" ... the new organization will have fewer levels, better communication channels, quicker decision-making mechanisms, an outcome orientation, and more flexibility."
J.I. Penrod and M.G. Dolence[19]

Information technology telescopes the rate of change enormously in organizations. An industrial-age organization had, in essence, time to watch itself evolve and develop. Interventions, adjustments, adaptations could be made incrementally, and centralized organizational hierarchies and reporting lines could be replicated in departments throughout the organization. Organizations were complex, but the complexity was bureaucratically created rather than organically created from within the organization in response to environmental or constituent needs. Change in organizations today may still be incremental, but the increments are astoundingly large—especially those stimulated by the information technologies.[20]

Exploratory studies, such as the one summarized in this paper, should raise more questions than they answer. They should spawn further investigation into the meatier issues that are exposed. Human resources planning, for example, can clearly benefit from focused research on specific areas such as changes in jobs due to technological change, as well as the effect of the information technologies on job satisfaction, empowerment, and productivity.

Whole areas of jobs were not included in our exploratory study, leaving many questions unanswered. What relationships would be found if administrative services computing were included in job content analysis, or if other information-based jobs in academic (user) departments were included? Would results be significantly different if conducted at institutions less integrated in their use of information technology, or in those technologically sophisticated but not administratively clustered under a CIO-type umbrella?

While intrinsically interesting to researchers, the results need to be applied in the day-to-day management of colleges and universities. Unless this is done—and done in an anticipatory way—existing personnel policies and procedures will fail. We do wonder if the increments of change wrought by information technology become so rapid as to make job content studies useless. In a truly networked organization, where each person participates in the network as a peer, there is no meaning to user vs non-user.[21] In such an organization, or in one based on "virtual" relationships,[22] there is no job stream and the current concept of job family is meaningless. Communication is open in the sense that

[19]Penrod and Dolence, p. 17.

[20]See James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, Mass.: Harvard University Press, 1989); Stanley M. Davis, *Future Perfect* (Reading, Mass.: Addison-Wesley, 1987; and Peter G. W. Keen, *Competing in Time* (Cambridge, Mass.: Ballinger, 1986).

[21]Sproull and Kiesler, p. 14.

[22]See W. H. Davidow and M. S. Malone, *The Virtual Corporation* (New York: Edward Burlingame Books, 1992).

every employee has access to every other employee, job responsibilities are more fluid as employees become part of ad hoc project teams, and hierarchical distinctions between management and workers are minimized.

All of these possibilities seem to argue that the first task an institution faces is determining a desired outcome—an anticipated future view that all parts of the organization can internalize, articulate, and accept as a responsibility.

In finding a definition or vision for a total organization, human resources planning can be a powerful motivator. Considering information jobs from a traditional compensable-factors approach can lead an organization to examine its definition of information and information technology and ultimately where related jobs belong on the resulting information continuum. In relation to other jobs, academic or administrative, the institution will begin to define the value of information jobs as expressed in direct compensation and benefits.

One of the heuristic values of this paper and study is that it highlights the central importance of human resources planning in the "informated" organization. It points to the need to develop a set of job evaluations to fit the overall information strategies of each institution. The definitions of factors alone can become powerful and influential forces for change for organizational values. The organization's whole value system, and the organizational culture which develops around that system, can be examined, retained, altered, or abandoned.

Compensable factors also reflect sets of relationships between people, values, and processes. For this reason, organizational structures remain a central concern. The CIO organization is one variation, but as experimentation with new, less hierarchical and departmentalized forms takes place, internal job structures will again be affected. As a more future-oriented approach is taken, greater emphasis can be placed on information technologies planning and, more importantly, in valuing (and building systems that can evaluate) the outcomes of human effort at work, rather than events or tasks.

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APPENDIX A: JOB EVALUATION FACTORS

KNOWLEDGE (KN)

Measures seven degrees of knowledge—from basic knowledge of work processes, methods, or equipment, to a deep and comprehensive knowledge that would normally be acquired through a formal doctoral level education or training, in a recognized field of specialization that is directly related to the type of work being done.

EXPERIENCE (EX)

Measures seven degrees of experience needed as the minimum to perform a job—from no experience or up to three months experience required, to ten years or more experience needed.

SUPERVISION RECEIVED (SR)

The degree of supervision received is measured by five degrees that begin with close supervision being needed for simple, routine duties to ensure completion, to a level where only policy direction is given and the incumbent sets virtually all goals and objectives.

ANALYTICAL SKILLS (AS)

Seven degrees define the extent to which work is routine, repetitive, and simple, or broad in scope and covering several functional areas.

FINANCIAL RESPONSIBILITY (FR)

Was defined on a grid of seven levels of responsibility and three levels of budget volume and allowed for up to forty-eight raw points to be assigned.

IMPACT OF ACTION (IA)

This factor defined six degrees, from minimal (where actions are limited to routine functions and impact is minimal) to major. At the upper end a job would have major responsibility for actions which often affect more than one division and sometimes the entire organization. Errors at this level would incur major problems and could affect long-term organizational performance.

SUPERVISION EXERCISED (SE)

Diversity and complexity were measured against a grid that allowed for up to forty points for various permutations in this factor. Diversity addressed how many functions the job supervised and complexity of the nature of the work being supervised.

HUMAN RESOURCES IMPACT (HR)

Six degrees measured the scope of human resources impact that a job had, ranging from no responsibility to the coordination of the management of more than one area, including responsibilities such as long-range human resource planning.

INTERNAL CONTACTS (IC)

Four levels of contact within the institution (from within the immediate work area to across schools or divisions) were combined with the four degrees that measured the nature of the contact on a forty-point scale, with the lowest contacts being routine exchange of information and the highest being diplomatic and persuasive kinds of interactions about complex matters.

EXTERNAL CONTACTS (EC)

A grid of four levels of contact, from almost none to high-level contacts with prominent people, was combined with four degrees that allow a range of up to twenty-one raw points to measure the nature of the contacts similar to those in the IC factor.

PHYSICAL EFFORT (PE)

Six degrees measured the amount of physical effort required to perform a job. The degrees ranged from largely sedentary, to near-continuous physical activity such as lifting heavy objects and climbing.

Appendix B: Job Descriptions

JOB A:
Database Training Instructor

The Johns Hopkins University
William H. Welch Medical Library

This position in the Applied Research Laboratory's User Services Group has responsibility for developing, modifying, and delivering an expanding program of training and outreach activities for the Lab's databases (including the Genome Data Base and Online Mendelian Inheritance in Man) and for related databases produced by other organizations. GDB and OMIM, supported by the Department of Energy and the National Institutes of Health, are central repositories for human gene mapping and genetic disease data. This is a Research Associate (non tenure-track faculty) position.

Duties:

- Teach courses and present demonstrations in the Lab training facility as well as at similar facilities at other universities and research centers, both nationally and internationally.
- Develop and evaluate training activities, both classroom and non-classroom-based, to reflect changes in the databases and the needs of the user community.
- Contribute to the design and updating of courses and other training materials appropriate to a diverse and distributed scientific community, including students, senior faculty, industrial researchers, clinicians, and information specialists.
- Present demonstrations at exhibit booths and offer workshops at scientific meetings.
- Provide feedback and input to the Lab's product development and data management groups.
- Provide support to the user community as part of the GDB user support team.

Requirements:

Graduate degree in the life sciences or related field; MLS or MA/MS in information systems; three to five years experience with and through knowledge of biological/medical databases, including the provision of product services/training/demonstrations to the user community. Excellent teaching and communication skills; ability to work with other professional staff, both in the Lab and at other institutions; strong commitment to user service; willingness to travel up to 20 percent. Training in molecular biology/genetics and experience with sequence analysis software is highly desirable.

From Public-Access Computer Systems Forum (PACS-L) listserv, February 23, 1993

JOB B:
Assistant to the Vice Provost for Extension Communication Systems

Iowa State University

The assistant reports directly to the Vice Provost for Extension and will be responsible for organizing and providing leadership and vision to Iowa State University's Extension Communication Systems. This is a new unit that will be formed to include the existing computer and communications units. This position will develop and maintain effective working relationships with appropriate campus departments, i.e., administrative data processing, computation center, library, university relations, printing, media resources center, WOI television station, etc. They will likewise develop and maintain effective external relations with appropriate state and federal agencies, i.e., public television, media link, community colleges and computer library, and database services. The successful candidate will provide strong administrative, supervisory, and program leadership to the unit, as well as participate as a team member of the Administrative Cabinet.

Candidates must have a master's degree, with a PhD preferred and/or course work or documentation of training and competence in systems/information management. A minimum of eight years of professional

experience in information management systems and a minimum of four years of first-level supervisory experience are required, with second-level management experience preferred. Candidates should have demonstrated effective communication, management, leadership and vision, cognitive and interpersonal skills, in addition to an ability to create, design, develop, and implement processes.

From Public-Access Computer Systems Forum (PACS-L) listserv, March 5, 1993.

JOB C:
Associate College Librarian for Information and Technology

Gettysburg College

A newly-created position intended to provide leadership and an integrated vision for library automation, media services, and user instruction on a highly networked campus. Supervises the librarians and support staff within these units and works closely with computing services. Coordinates the above services with the library's programs of instruction in the use of both internal and external information resources. Serves as the associate college librarian and acts on behalf of the college librarian as appropriate.

Gettysburg is becoming a model among liberal arts colleges for utilization of information technology to support classroom teaching and student and faculty research. Gettysburg was the second liberal arts college to join the Coalition for Networked Information.

Qualifications:

ALA accredited degree in library and information science desirable but alternative qualifications will be considered for exceptional candidates.

The following qualifications will be considered in reviewing applications:

- additional graduate work
- substantial, and successful, administrative experience in managing a complex set of responsibilities (including new program development and/or grant writing) in a library or a library-related organization
- knowledge of libraries, computing, and media services and their potential in a networked environment
- experience in providing instructional services to faculty and students
- proven record of working collegially and cooperative in a complex work environment
- strong oral and written communication skills

From Library Administration and Management (LIBADMIN) listserv, February 25, 1993

JOB D:
Coordinator of Centers for Public Access to the Electronic Library

Cornell University's Albert R. Mann Library

The Albert R. Mann Library at Cornell University is seeking a librarian to manage the areas within the library which provide the public with access to the electronic library. Workstations in these areas connect users to bibliographic, numeric, full text, and spatial information in electronic form.

General responsibilities include:

- manage two microcomputer centers, one on the first floor and one on the second floor of Mann Library
- administer the operational budget
- supervise one support and several student staff
- participate in the library's collection development program by selecting applications software and multimedia materials
- determine how equipment and resources should be arranged
- teach students and faculty how to use information retrieval systems and applications software
- train staff to assist in the use of databases and the management of information

Mann Library supports Cornell University's College of Agriculture and Life Sciences, the College of Human Ecology, the Division of Nutritional Sciences, and the

Division of Biological Sciences. The library is implementing an electronic library entered through a central gateway, available across campus networks and from within the library building. The library's two microcomputer centers provide access to the electronic library and are also used for instruction and access to applications software. They contain over fifty Macintosh and DOS computers, used by students, faculty, and staff to access the Internet, and a collection of over 120 online and compact disk databases. These facilities attracted over 60,000 users during the 1991-92 academic year.

Qualifications required:

- MLS from ALA accredited school
- excellent communication, teaching, and interpersonal skills
- at least three years of professional library experience in an academic setting
- supervisory experience
- experience with computer, compact disk, and telecommunications technologies for information management.

Qualifications highly desirable:

- experience with teaching information management and computer use
- experience with providing reference service in an academic setting
- subject background in life or social sciences.

From electronic mail communication with the authors, March 3, 1993.

JOB E:
Libraries Systems Coordinator

Smith College Libraries

Primary Function:

Coordinate planning, installation, training, and operational support for hardware, software, and internal, and external computer networks dedicated to library functions including the integrated library automated systems, stand-alone and networked CD-ROM systems, Internet resources and remote services, and library office automation.

Major duties:

- Serve as the principal internal expert on the integrated library automation system supporting acquisitions, cataloging, serials, OPAC, circulation, and other functions. Work closely with library staff, vendors, Information Systems, and automation staff at the five colleges to determine system functions and characteristics, monitor system performance and maintenance, plan hardware and software changes, and respond to internal and external inquiries about the system.

- Coordinate and monitor the library's on-site file servers, software for office and reference use, network accounts, and related files. Maintain relevant documentation, procedures, and records for the library, assign passwords and track accounts; specify and manage library aspects of remote services contracts, licenses, and external automation services.

- Coordinate installation, operation, training, and licensing for CD-ROM or similar local networks supported by the library across campus, and for Internet-based resources and services for library staff and patrons. Work with faculty, students, library, and information systems staff on design, acquisitions, and policy development for campus use of networks.

- Assess training needs of library staff and users in library and office automation systems and design approaches to meet those needs. Respond to basic questions on a variety of software and hardware problems, with the resources of Information Systems or the five colleges as a higher level of support. Conduct classes and briefings for staff, students, and faculty on the uses of information technology for library and related services; write user-oriented documentation of various kinds.

- Coordinate with Information Systems and other external organizations to ensure proper installation of equipment, and configuration of networks and operating systems in the library; investigate and troubleshoot equipment, software, and network problems in library areas; know locations of all equipment, cables,

switches, and related items; ensure proper data backup and disaster recovery planning.

- Undertake minor custom library-specific programming where appropriate, utilizing the resources of Information Systems, vendor contracts, and external organizations for more significant projects.

- Serve as principal point of contact for all automation-related issues and inquiries in the libraries, delegating to and coordinating with other internal and external staff and organizations. Specifically, function as principal liaison to Information Systems, the five colleges' automation groups, NELINET, and library technology firms and associations. Oversee relevant projects, grants, and cooperative initiatives. Coordinate staff involvement in automation user groups.

- Conduct long-range planning for the continued integration of information technology into library operations campus wide. Work closely with Non-Print Resources Center on the intersection of computing and media technology in library services. Assist in the formulation of library and campus policies related to the educational, administrative, and other implications of information technology. Maintain professional awareness of regional and national developments in library and information technology and services.

- As a member of the library senior staff, serve on the Staff Council, share administrative duties with division coordinators, and carry out at the request of the director specific administrative assignments not limited exclusively to technical concerns.

From electronic mail communication with the authors, February 27, 1993

JOB F:
Information Technologies Librarian

North Dakota State University Libraries

A new position, the Information Technologies Librarian, is being developed at the North Dakota State University Libraries to manage the expansion of an existing data processing unit. This newly defined position will report to the Director of Libraries. Primacy will be given to identifying and defining the NDSU Libraries' telecomputing and computing needs and strategies as an element in the campus' infrastructure requirements to maintain and advance quality academic programs. The successful candidate will interact with faculty, students, and campus administrators, and work cooperatively with computer center staff to coordinate the development, implementation, and updating of these and related library services.

The new Information Technologies Unit will be responsible for defining, implementing, operating, and utilizing automated systems to support the mission of the NDSU Libraries. MSUS/PALS, the NDSU Libraries' online information system, supports a broad range of library functions, including acquisitions (both serials and monographs), fund accounting, authority control, and circulation/reserves/interlibrary loan/inventory control. The online public catalog provides access to the collections of the NDSU Libraries, fifty-two libraries throughout Minnesota, to other PALS libraries in North and South Dakota, and to a growing number of external bibliographic databases. The Information Technologies Unit will also be responsible for internal administrative computing systems, microcomputer software support, and CD-ROM expansion and networking. Design and development is done in a team environment, with heavy emphasis on user communication and involvement. Current unit staffing includes one data processing coordinator, one data communications specialist, plus part-time student help.

Duties and Responsibilities:

Primary responsibilities include: 1) effective enhancement and operation of the library's automated systems; 2) proactive liaison with campus, state, and regional groups and individuals associated with information technology issues relevant to the NDSU Libraries; 3) keeping abreast of national networking developments, actively participating in CNI working groups, NISO,

ITEF and other national initiatives, determining appropriate and feasible responses of the NDSU Libraries; and 4) contributing to library staff training activities to help them most effectively take advantage of the array of systems functions available.

Additional responsibilities include: 1) coordinating library projects with the campus computing center and the North Dakota Higher Education Computing Network (HECN); 2) providing leadership for automated system support and development for the Libraries; 3) negotiating and managing vendor contacts for all library systems operations. As a member of the Director's Council and of the Data Processing Coordinating Team, the person in this position will be expected to contribute to the creative administration of the NDSU Libraries, actively participating in long-range planning for information technologies, systems applications, and their fiscal support.

Qualifications:

- graduate degree(s) in library science, information systems, information science, or computer science, plus progressively responsible professional experience in one or more of these disciplines
- excellent oral and written communication skills
- flexibility and the ability to work collegially
- demonstrated ability to analyze, synthesize, and interpret technical information, and to explain design and operations of a technical system to diverse audiences
- demonstrated ability to establish excellent working relationships with technical personnel, library staff, and end users.

Preferred qualifications include:

- demonstrated supervisory skills
- knowledge of current developments in library automation applications (such as gateways, LAN/WAN, MARC record structure)
- experience in an academic computing environment
- grant writing experience
- experience in developing and managing budgets
- academic library experience in reference or other user-contact areas of information services.

From electronic mail communication with the authors, February 25, 1993

JOB G:
Networked Resources Coordinator

Northwestern University
Academic Computing and Network Services

Summary:

The very rapid growth in the availability of information resources on the Internet and other computing and telecommunications networks offers new opportunities for the integration of computing use into University instruction and research. To promote and integrate the utilization of networked resources into the life of the University, the Networked Resources Coordinator will develop programs that inform University faculty about Internet services, and will work closely within Academic Computing and Network Services to develop consulting, tutorial, and other infrastructure services to support increased use of the Internet.

As a member of the Instructional Technology Group, the Networked Resources Coordinator will also participate in the group's other consulting and development work with University faculty, serving to offer special expertise in the areas of information retrieval and the system of scholarly communication.

Areas of activity:

- Develop a coherent program of instruction on the scope and use of Internet information resources, with teaching materials targeted to specific Northwestern audiences (faculties across the campus, NU administrators, staff in ACNS, the Library, and other Northwestern units, and students).
- Provide in-service training for ACNS consulting staff on the use of Internet-based resources and other areas of information retrieval.
- Develop a service program to promote the distribution and use of client software for servers on the Internet, such as Gopher, WAIS, news readers, and electronic mail readers. Make available useful documentation on these tools.
- Work within the Instructional Technology Group to build resources and expertise in areas of electronic textual processing for Northwestern researchers.

- Provide ongoing direction for the evolution of NUInfo, and for campus-wide information system development at Northwestern generally.

- Work with the Database Access Advisory Committee, ACNS, the University Library, and other University units to evaluate and recommend electronic information resource acquisitions by the University. Providing staff support for the DAAC Committee's work, the NRC will develop a system for general auditing of the University's expenditures for electronic data resources.

- Work with the University's new Center for Effective Teaching to help promote the use of information technology in teaching innovation at Northwestern.

From electronic mail communication with the authors, February 26, 1993.

JOB H:
Computer Assisted User Services Librarian

Emory University

General function:

Participate in the development and implementation of the computer-based information services of the General Libraries Public Services Division, including computer-based applications in the reference, government documents, and chemistry departments, with special emphasis on service applications utilizing microcomputer technologies; serve as General Libraries liaison to the Faculty Information Technology Center (FITC).

Specific duties:

- Serve as a leader member of the Public Services team in the development of computer-based services; coordinate planning, development, and implementation of library information and reference services which employ electronic resources as a delivery technology for library services.

- Serve as the liaison to the Faculty Information Technology Center, including participation in FITC services of outreach to University Faculty; serve as selector for the FITC software applications materials budget.

- Manage the development of the libraries compact-disc services, including planning for selection of hardware components to support database and software applications; work with the libraries collection management staff, and library selectors, to coordinate and undertake the evaluation, selection, and implementation of software, and compact-disc resources.

- Direct the implementation of, and provide lead management for, the planned local area network; coordinate technical support with the Library Systems Office.

- Develop a staff training program for electronic information and reference applications, including the implementation of a training syllabus and methodology.

- Assist in developing a program plan and agenda for microcomputer-based bibliographic instruction and library access aids.

- Communicate developments in, and promote state of the art applications of, electronic-based information and reference resources for the libraries' users and staff.

- Work in a close team-oriented association with appropriate individuals in the libraries' service departments, systems office, and Information Technology Division.

- Coordinate the General Libraries online searching program; perform searching duties as required in conjunction with the reference department.

- Serve on the Electronic Resources Committee (ERC), and the Public Services Council (PSC)

- Hire, train, evaluate and direct the work of support staff.

- Participate in the work of library and university committees.

- Perform other duties as assigned, e.g. campus Internet training.

Qualifications:

MLS or equivalent from an ALA accredited school; minimum of two years experience with library public service applications of microcomputer technologies, preferably in a research library setting; experience with online database searching; experience with or demonstrated knowledge of local area network technology; strong interpersonal, communications, analytical, and planning skills; ability to view public services and library developments in a broad strategic context.

From electronic mail communication with the authors February 25, 1993

JOB I:
Computer Lab Librarian

The George Washington University Medical Center
Paul Himmelfarb Health Sciences Library

Position summary:

The Himmelfarb Library Computer Lab is located on the third floor of the library in the Audiovisual Study Center (AVSC). It currently consists of a local area network with twenty-two workstations running computer-assisted instruction (CAI) programs and applications software. There are additional freestanding workstations and videodisk stations. The Computer Lab serves as the delivery site for a variety of required Medical School CAI programs. The Computer Lab Librarian works closely with the staff of the AVSC, the Department of Computer Medicine, and other faculty to integrate software into the curriculum and is responsible for the daily administration of the network, setting Computer Lab policies and procedures, providing instruction as needed, and long-range planning.

Duties and responsibilities:

1. Administers the daily operations of the Computer Lab's local area network, including the installation of new software and workstations, and maintains free-standing and videodisk stations.
2. Acts as a library liaison to the Department of Computer Medicine, which provides extensive network and hardware support.
3. Works with faculty to integrate computer-assisted instruction materials into the curriculum. Helps set policies and standards for the introduction of new network-based programs into the curriculum.
4. Sets policies and procedures for the daily operation of the Computer Lab. Maintains documentation on network operations.
5. Troubleshoots hardware and software problems on workstations, both on and off of the network.
6. Works closely with the staff of the Audiovisual Study Center (AVSC) to coordinate Computer Lab routines with AVSC routines and to train student assistants in basic Computer Lab procedures and network troubleshooting techniques.
7. Trains the Audiovisual Senior Clerk in network start-up routines. Trains the Library Specialist in basic network trouble-shooting routines and to provide assistance to Computer Lab users in desktop publishing, presentation, and assigned programs.
8. Supervises student network assistant ten hours per week. Supervises Technical Assistant fifteen hour per week.
9. Works with the Collection Development Librarian to select and maintain Computer Lab software and books.
10. Works closely with the User Education Coordinator to plan, design, and teach classes in basic computer applications such as word processing. Conducts Computer Lab tours, demonstrations, consultations, and orientations as needed.
11. Assists the Department of Computer Medicine in the administration of the computer literacy requirement for medical students.
12. Maintains and updates Computer Lab publications, promotional materials, and instructional manuals with the help of the Library Specialist.

13. Maintains statistics and submits annual and semi-annual reports.

14. Makes recommendations for new equipment.

15. Coordinates the interface of the Computer Lab network with the compact disc and teaching classroom networks.

16. Other duties and special projects as assigned.

Essential skills:

- *Interpersonal*
  Strong interpersonal and communication skills, including public presentations and teaching. Excellent teamwork, collaboration, and negotiation skills required.

- *Management*
  Demonstrated supervisory skills plus an ability to motivate staff and colleagues; strong organizational skills for fulfilling commitments, completing projects, and meeting deadlines.

- *Technical*
  Knowledge of microcomputer hardware (IBM-PC or compatibles), software applications packages (WordPerfect, Harvard Graphics, and Pagemaker), and the role of computer-assisted instruction in the medical school curriculum. Knowledge of networking principles. Experience teaching microcomputer basics and in program development and evaluation.

Qualifications: master's degree in library or information science and at least three to five years experience in a biomedical library working with microcomputers.

From electronic mail communication with the authors, February 25, 1993

JOB J:
Manager, Information Access

Computing and Information Technology
Princeton University

Princeton University seeks project leader with vision to guide the development and growth of Princeton's new online information system. Technical skills which embrace a variety of mainframe and desktop operating systems, and quality management skills are essential to make this new system a reality. This project will provide seamless, easy access from supported campus platforms to a wide variety of campus, local, national, and international information and systems.

The ideal candidate will be familiar with an academic environment, understand the information needs of an academic community—and beyond—to participate in the project as data providers and as users.

Systems design, programming, and project management experience are required. Experience with at least three of the following (more preferred) is required: Intel-based microcomputers, Apple computers, Unix systems and platforms, database systems, the Internet, NeXTstep, library systems, and Gopher. Hands-on experience with organizing and searching large amounts of data is essential, as is the ability to communicate effectively with technical and non-technical people. Experience in marketing or public relations is a plus. Bachelor's degree or equivalent a must. Rank and salary commensurate with background and experience.

From an advertisement in the Chronicle of Higher Education, *April 21, 1993, page 25.*

Apple Computer, Inc.

Company Profile

Apple Computer, Inc. develops, manufactures, and markets personal computer systems—education and business tools that extend our capabilities to learn, work, communicate, and play.

Involvement in Higher Education

Since the introduction of the Macintosh personal computer in 1984, Apple has enjoyed growing success in the higher education market. Much of the Macintosh computer's popularity on campus is due to its intuitive graphic interface, ease of use and learning, and the large base of innovative software available. Apple has also invested heavily in bringing new hardware technologies, networking and communications solutions, software development, and strong program support to higher education. Today, Apple offers a comprehensive suite of programs in administration, instruction, and research that provide an infrastructure of support for any campus computing plan.

The Macintosh personal computer system assists technology professionals on campus to effectively manage complex campus computing environments by providing them with the capability to access information quickly, easily, and transparently through any type of campus network, and by serving as a front-end into large-scale mainframe relational databases. The Macintosh also has an intuitive graphic interface that maintains a high level of software consistency and integration across all applications, resulting in low requirements for support and training. At the University of Texas at Austin, a Macintosh is being used to access the IBM mainframe. This desktop client was developed on HyperCard with NATURAL Connection from Software AG. Several components of this "University Workstation" project have been completed—the Library System (UTCAT), Fiscal Information System, and University Directory. The University's goal is simple, secure, campus-wide access to university information.

Apple's higher education programs offer innovative support programs that focus on lowering the cost of campus computing, including special pricing, student and institutional financing, and site licensing. An exchange of information about technology and education is facilitated through conferences, seminars, publications, and AppleLink, an online database, electronic mail, and bulletin-board system that links scholars and educators directly to Apple, their colleagues, developers, and dealers. In addition, the AppleLink/BITNET/Internet mail relay facilitates communication between colleagues on BITNET, the Internet, and AppleLink.

Products and Marketing Directions

Apple continues to introduce new products that offer innovative solutions for both academe and administration. The compact Macintosh product line includes the Macintosh Classic II which offers good performance at affordable prices and flexibility for those who need an easy-to-use, powerful navigation tool for accessing, managing, and communicating information. The modular Macintosh product line includes the Macintosh LC II, Macintosh IIsi, Macintosh IIci, vi, vx, and Macintosh Quadra series of computers. These modular systems provide the power needed for transparent access to an array of databases, advanced programming, software development, simulations, and high-speed communications. The Macintosh PowerBook notebook computers provide the advantages and power of Macintosh everywhere you go. The Macintosh family of personal computers can be easily and inexpensively interconnected with Apple's network cabling. This is called the AppleTalk Network System, and it supports a mix of cabling standards such as twisted pair, fiber, Ethernet, and Token Ring. They can also be seamlessly integrated with DEC, IBM, UNIX, and supercomputer hosts on campus-wide and nationwide networks with DECnet, SNA, and TCP/IP protocols.

The advent of Apple's QuickTime software, with CDSC CD-ROM, video laserdisc, HyperCard, new hypertext reference tools, and optical media, allows individuals to access, use, and create information from a variety of sources—print, images, video, sound—and customize the information to meet their individual needs.

Planning for the Future

Many colleges and universities are Apple's partners in experimenting with both current and future technologies. Apple continues to pursue and support strategic relationships that will help colleges and universities integrate technologies into campus environments and plan ahead for the future.

One of these is "The Apple Computer Higher Education Gopher Server." It is available through the Internet, on a Gopher server that is housed at the University of Minnesota. This pilot program provides an innovative solution to the challenge of maintaining ongoing communication with the higher education community. It also allows interaction over the network in a "dialog" folder that is established for seven different academic disciplines: (1) Business, (2) Computer Science and Engineering, (3) Library and Information Systems, (4) Mechanical Engineering, (5) Medical and Health Sciences, (6) Schools of Education, and (7) Foreign Language. It provides a forum to share information on the use of technology within curriculum and research. Additional information is provided on: Apple products, regional marketing news, PR and HED marketing, Intellimation software catalog, *Query* publications, and *Syllabus* publications.

Another is the Apple Library of Tomorrow (ALOT), which makes equipment and software grants to libraries and other institutions that have innovative projects for the archiving and dissemination of information. These organizations include rural school and public libraries, state library agencies, special libraries, museums, rare manuscript centers, national libraries, nonprofit organizations, and consortia of different institutions.

In 1992, ALOT focused on libraries that are connecting to the Internet and to institutions that are providing new services and information for network users. In 1993, ALOT continued to stress Internet connectivity but expanded it to include the broad topic of community information networks.

As the computing needs of higher education become even more complex, Apple continues to work closely in partnership with administrators, faculty, and students to make technology useful and meaningful in education.

Since joining CAUSE in 1985, Apple Computer, Inc. has made numerous donations to CAUSE supporting the predominantly Mac-and-VAX CAUSE office computing environment. The most recent donation, in June 1992, included two PowerBooks and a Quadra 700. At past CAUSE annual conferences, Apple has hosted exhibits, sponsored refreshment breaks, provided computers and printers to allow on-site printing of nametag sheets and the publication of a daily conference newsletter, and set up HyperCard-based conference messaging systems. Apple has funded the publication of two CAUSE Professional Papers: Open Access: A User Information System, CAUSE Professional Paper #6, *and* Reinvesting in the Information Job Family, CAUSE Professional Paper #11.

Contact:
Bruce Stancombe
Higher Education Marketing
Apple Computer, Inc.
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Professional Paper Series

#1 ***A Single System Image: An Information Systems Strategy***
by Robert C. Heterick, Jr.

Strategic planning for information systems, with a description of components needed to purvey an institution's information resources as though they were delivered from a single, integrated system. Funded by Digital Equipment Corporation. 22 pages. 1988. *$8 members, $16 non-members.*

#2 ***Information Technology—Can It All Fit?***
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Three presentations from the Current Issues Forum at CAUSE88, where Paige Mulhollan, Wright State University President, advocated highly centralized management of information resources; Robert Scott, Vice President for Finance at Harvard University, discussed factors that led to a decentralized approach at Harvard; and Thomas W. West, Assistant Vice Chancellor for Computing and Communications Resources at The California State University System, explored alternative models. Funded by IBM Corporation. 17 pages. 1989. *$8 members, $16 non-members.*

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by Bernard W. Gleason

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An examination of the management structures and approaches that can make the application of new technology successful. Focuses on research and writings of management and communication professionals on organizational culture, managing change, end-user focus, attention to detail, and the importance of "fun." The author shares experiences of the Maricopa Community Colleges in these processes. Funded by Digital Equipment Corporation. 30 pages. 1991. *$8 members, $16 non-members.*

#8 ***Sustaining Excellence in the 21st Century: A Vision and Strategies for College and University Administration***
by Richard N. Katz and Richard P. West

A discussion of a "network organization" vision which the authors see as a necessary response of colleges and universities to challenges of the 1990s. Strategies set forth in this paper support an information-intensive modern higher education institution, requiring increasingly sophisticated leadership and an administrative infrastructure which is optimized for service, speed, quality, and productivity. Funded by the IBM Corporation. 22 pages. 1992. *$8 members, $16 non-members.*

#9 ***Reengineering: A Process for Transforming Higher Education***
by James I. Penrod and Michael G. Dolence

An overview of the principles and processes of reengineering (transformation) to move higher education enterprises into the new information/service economy. Includes a review of philosophies already widely used in business, applications in higher education, and implications of reengineering for information technology units. Funded by Coopers & Lybrand. 32 pages. 1992. *$8 members, $16 non-members.*

#10 ***Reengineering Teaching and Learning in Higher Education: Sheltered Groves, Camelot, Windmills, and Malls***
edited by Robert C. Heterick, Jr.

Five essays by information technology leaders with different institutional perspectives about how information technology can change the way higher education is delivered, followed by four commentaries on those essays. Includes a resource list for obtaining information about educational uses of information technology. Funded by Digital Equipment Corporation. 48 pages. 1993. *$12 members, $24 non-members.*

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CAUSE Professional Paper #10

Reengineering Teaching and Learning in Higher Education:

Sheltered Groves, Camelot, Windmills, and Malls

Edited by Robert C. Heterick, Jr.

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Editor Robert Heterick brings together perspectives from visionary information technology leaders at four different types of institutions to answer the question:

> *Can IT help reengineer the teaching and learning process in higher education?*
> *And if so, how?*

The authors' essays and opinions differ as much as the missions of their respective institutions—a research university, a small liberal arts college, a community college, and a large state "comprehensive" university. While some hold reservations based on their campus situations and professional experiences, all the authors express their enthusiasm for the positive changes technology can bring to the educational process.

Providing further dimension to the discussion are commentaries by respected professionals which delineate areas of consensus and dissension on a subject of immediate interest and concern to all of higher education.

Robert C. Heterick, Jr., is president of EDUCOM. Previously, he was vice president for information systems at Virginia Tech and served as chair of the CAUSE Board of Directors.

Reengineering Teaching and Learning in Higher Education: Sheltered Groves, Camelot, Windmills, and Malls
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